**WHAT IS CLAIMED IS:**

1. A cathode composition for a lithium-ion battery having the formula $Li[M^1_{(1-x)}Mn_x]O_2$ where $0< x <1$ and $M^1$ represents one or more metal elements, with the proviso that $M^1$ is a metal element other than chromium,

said composition characterized as being in the form of a single phase having an O3 crystal structure that does not undergo a phase transformation to a spinel crystal structure when incorporated in a lithium-ion battery and cycled for 100 full charge-discharge cycles at 30°C and a final capacity of 130 mAh/g using a discharge current of 30 mA/g.

2. A cathode composition according to claim 1 wherein $M^1$ is selected from the group consisting of Ni, Co, Fe, Cu, Li, Zn, V, and combinations thereof.

3. A cathode composition according to claim 1 wherein $x = (2-y)/3$ and $M^1_{(1-x)}$ has the formula $Li_{(1-2y)/3}M^2_y$, where $0<y<0.5$ and $M^2$ represents one or more metal elements, with the proviso that $M^2$ is a metal element other than chromium,

said cathode composition having the formula $Li[Li_{(1-2y)/3}M^2_yMn_{(2-y)/3}]O_2$.

4. A cathode composition according to claim 3 wherein $0.083<y<0.5$.

5. A cathode composition according to claim 3 wherein $0.167<y<0.5$.

6. A cathode composition according to claim 3 wherein $M^2$ is a single metal element.

7. A cathode composition according to claim 6 wherein $M^2$ is Ni.

8. A cathode composition according to claim 1 wherein $x = (2-2y)/3$ and $M^1_{(1-x)}$ has the formula $Li_{(1-y)/3}M^3_y$, where $0<y<0.5$ and $M^3$ represents one or more metal elements, with the proviso that $M^3$ is a metal element other than chromium,

said cathode composition having the formula $Li[Li_{(1-y)/3}M^3_yMn_{(2-2y)/3}]O_2$.

9. A cathode composition according to claim 8 wherein $0.083<y<0.5$.

10. A cathode composition according to claim 8 wherein $0.167<y<0.5$.

11. A cathode composition according to claim 8 wherein $M^3$ is a single metal element.

12. A cathode composition according to claim 11 wherein $M^3$ is Co.

13. A cathode composition according to claim 1 wherein x = y and $M^1_{(1-x)}$ has the formula $M^4_yM^5_{1-2y}$, where $0<y<0.5$, $M^4$ is a metal element other than chromium, and $M^5$ is a metal element other than chromium that is different from $M^4$,

said cathode composition having the formula $Li[M^4_yM^5_{1-2y}Mn_y]O_2$.

14. A cathode composition according to claim 13 wherein $0.083<y<0.5$.

15. A cathode composition according to claim 13 wherein $0.167<y<0.5$.

16. A cathode composition according to claim 13 wherein $M^4$ is Ni.

17. A cathode composition according to claim 13 wherein $M^5$ is Co.

18. A cathode composition according to claim 13 wherein $M^4$ is Ni and $M^5$ is Co.

19. A lithium-ion battery comprising:

(a) an anode;

(b) a cathode; and

(c) an electrolyte separating said anode and said cathode,

said cathode comprising a composition having the formula $Li[M^1_{(1-x)}Mn_x]O_2$ where $0< x <1$ and $M^1$ represents one or more metal elements, with the proviso that $M^1$ is a metal element other than chromium,

said composition characterized as being in the form of a single phase having an O3 crystal structure that does not undergo a phase transformation to a spinel crystal structure when said lithium-ion battery is cycled for 100 full charge-discharge cycles at 30°C and a final capacity of 130 mAh/g using a discharge current of 30 mA/g.